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WOODARD, EMHARDT, MORIARTY, MCNETT & HENRY LLP
BANK ONE CENTER/TOWER
111 MONUMENT CIRCLE, SUITE 3700
INDIANAPOLIS, IN 46204-5137

EXAMINER

JAWORSKI, FRANCIS J

ART UNIT PAPER NUMBER

3737

DATE MAILED: 07/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/722,989

Applicant(s)

TRUCCO, ANDREA

Examiner

Jaworski Francis J.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) 26,27 and 34-42 is/are allowed.
6) ☒ Claim(s) 1-25 and 28-33 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 22 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claims 1-25, 28-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

1) A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

In the present instance, claim 1 recites the broad recitation 'acoustic' , and the claim also recites 'ultrasonic' which is the narrower statement of the range/limitation. That is to say, the term 'acoustic' is often used broadly to describe vibratory pressure transmission in the audible (e.g. microphone or low Khz range) or supra-audible (ultrasonic range) as distinct from electromagnetic propagation. Here applicant is using

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the acoustic term in line 1 and in subsequent lines the term 'electroacoustic transducer(s)' is consistent with 'acoustic' in pertaining to the transduction associated with acoustic propagation. However in adding in line 1 a particular preference of 'ultrasonic' (understood to embrace above 20kHz or at least above-hearing, see Wright et al col. 11 lines 22-25.) thereafter a confusion is presented: does this claim embrace sonar imaging, low-frequency including auditory range vibratory imaging or only ultrasonic imaging? See MPEP 2173.05(c) regarding the undesirability of including preferences which obscure range limitations within a claim.

2) Claim 1 further recites the limitation "said separated components" in line 16 whereas line 14 antecedent terminology pertains to a single component. There is thus insufficient antecedent basis for the line 16 limitation in the claim. It is unclear for example whether applicant is entertaining combining the fundamental (first frequency) as a component with the even harmonic (second frequency) component for display (termed blending in the art) or is entertaining capturing more than one even harmonic component or is referring loosely to 'components' as image components meaning scanline components of the display each being a set of second frequency component signals or is referring to components in the sense of claim 4 line 3 i.e. spectral components in the even harmonic band loosely being called a 'second frequency' although not strictly a single frequency.

3) Dependent claim 6 pertains to 'the harmonic components' which lacks antecedence with both 'even harmonic' and 'component' (both singular and in the case

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of the former excluding odd harmonics) in the parent claim. Additionally the claim is run-on meaning after 'frequency' in line 5 add —and— or —such that — (?).

4) In the case of claims 7 and 29 it appears that 'sen' is Italian for 'sine'. More importantly the claims are indefinite in that since the parent claims announce e.g. claim 1 in lines 12 – 14 that the delay can pertain to a point in the body and is a function of distance, it appears that applicant is defining composite delay (beam focusing as well as steering).

Yet the Jeong patent (US6658141) - which the Examiner is relying on here for definitions and not for relevance to the invention per se – evidences that the delay equation for the near field or far field (equations (1), (2) of Jeong col. 4) is composited of a non-linear quadratic, distance-R-dependent focusing delay (equation (3)) and a linear, distance-independent steering delay (Equation (4)). It appears that this latter component $[x/c \times \sin(\Theta)]$ is what applicant is referring to in claim 7 and therefore the equation of claim 7 is proposing a steering delay adjustment in its righthand term which advantageously isolates the harmonic.

However since for a fixed fundamental f_0 claims 7, 29 then pertain to a linear, range-independent steering delay feature they apparently fall outside the scope of claims 1, 26 which are effectively describing a non-linear, range-dependent focusing delay selection.

5) By analogy, the 'particularly' language creates a range (second harmonic) within a range (harmonic) issue in claims 28, 30.

Dependent claims variously inherit the defects.

Claim Rejections - 35 USC § 102

[Parenthesized numerals pertain to the specific claim(s) towards which the preceding rejection statement is addressed.]

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 4-5, 15-23, 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Hossack et al (US5740128) with its incorporation by reference of Wright et al (US5685308). Hossack et al is applicable against the method as follows:

Transmits....operation of transmitter 12; receiving with an array...activity of ultrasonic array 16; synchronizing by general application of delays....col. 5, summing ...receive beamformer 22 and col. 7, separating an even harmonic...col. 2 lines 58-67 with harmonic of order $\frac{1}{2}$ (even sub-harmonic) or 2 (even harmonic) selected (Claim 5), together with col. 3 lines 4-7 suggestion to filter the fundamental; transforming the harmonic for display and displaying same– see title of Hossack et al.

[Note: the Examiner is interpreting the above-noted indefiniteness in the transforming step to pertain to transforming the separated harmonic or components of its band for display.]

Hossack et al incorporates Wright et al for the details of the receive beamformer being used, see. Continuing then, receive-beamformer range-based time delays are a function of acoustic propagation velocity as well as distance to the focal point because of time-range interrelationship, see col. 16 lines 13-15 of Wright et al. (Claims 1, 22). Whereas Hossack et al notes a frequency dependency for the receive beamformer in Appendix 2 lines last below cols. 9-10, Wright et al makes clear that the frequency of the received signals incorporates into the delay as does the array position of the transducer. Specifically, the fine focusing delay applied at complex multiplier R-156 via phase processor C-266 input, see col. 20 lines 60-65 and col. 26 line 52 – col. 27 bottom is received-signal-frequency dependent for, as Wright et al note, the applied phase correction to the delay is a result of the downshift in centerband due to the frequency dependence of ultrasound propagation within ^tissue. Finally, the transducer distance enters the delay equation as part of the aperture profile, see col. 20 lines 37-48. (Claims 1-2, 5, 22).

As described above, as the received signal downshifts with depth relative to the original transmission the fine delay correction applied at R-156 prior to beam summation at R-126 of Fig. 3 would act to suppress the transmitted fundamental now shifting out of the passband, and as such the downshift frequency is incrementally referenced to a pre-increment initial frequency which relates to the transmitted frequency, all by small fraction changes.. (Claims 4, 23, 25).

Fig. 3 of Hossack et al is 'smoothed' relative to a square wave see col. 1 lines 55-61 and is stated to be a gaussian pulse. It is also reasonably characterizable as

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approximating an isosceles triangle shape as crafted and is filtered, see col. 5 lines 8-11. (Claims 15-21.). .

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-5, 15-23, 25 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Hossack et al (US5740128) in view of Wright et al (US5685308). The former is applied as above. The latter is also applied as an incorporation by reference into the former as above, hence together constitute a single teaching. The distinction is that, since Hossack et al on the one hand invokes that the receive beamformer 22 (digital) filters to pass the harmonic (see col. 3 lines 4-6 and col. 1 lines 32-43) and clearly invokes Wright et al as the implementing architecture (col. 7 lines 32-38). yet Wright et al on the other hand employs digital filters which suppress the harmonic as they are neither concerned with harmonic nor contrast agent (harmonic) imaging (col. 19 lines 1-11), the Examiner is arguing that Wright et al col. 7 lines 30-33 considered together with the aforementioned Hossack et al passage and the h1 – h3 bypass disablements of Appendix 2 of Hossack et al would render obvious the selective filtering to separate a harmonics component irrespective of the apparent superficial

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incompatibility of Wright et al. (Claim 1). Otherwise delay and harmonic and waveform and bandpass features are as argued above. (Claims 2, 4-5, 15-23, 25).

Allowable Subject Matter

Claims 3, 6 – 14, 24, 28-33 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Claims 26, 27, 34-42 are allowed.

Patentability Assessment

1) Certain of the claims currently contain confusion as to scope due to acoustic/ultrasonic terminologie and antecedence issues. Additionally the indefiniteness rejection regarding focusing versus steering delay mirrors the Examiner's uncertainty as to settlement wording identifying the patentable invention.

2) The Hossack et al –based rejection is effectively predatory upon the fact that the base method claim does not sufficiently relate the frequency-dependency of delay with the selective processing of even harmonics. Therefore, any delay adjustment made based upon frequency of the received signal in an otherwise conventional harmonic imaging system, such as frequency adjustment of delay adjustment for received band down-shift due to frequency-dependent tissue attenuation expressed by the reference suffices to meet the current method base claim language. The allowed

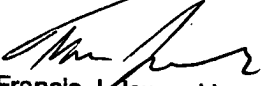
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apparatus claim serve as a remediation template with respect to the method claim language.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 703-308-3061.

FJJ:fjj

06-24-04


Francis J. Jaworski
Primary Examiner